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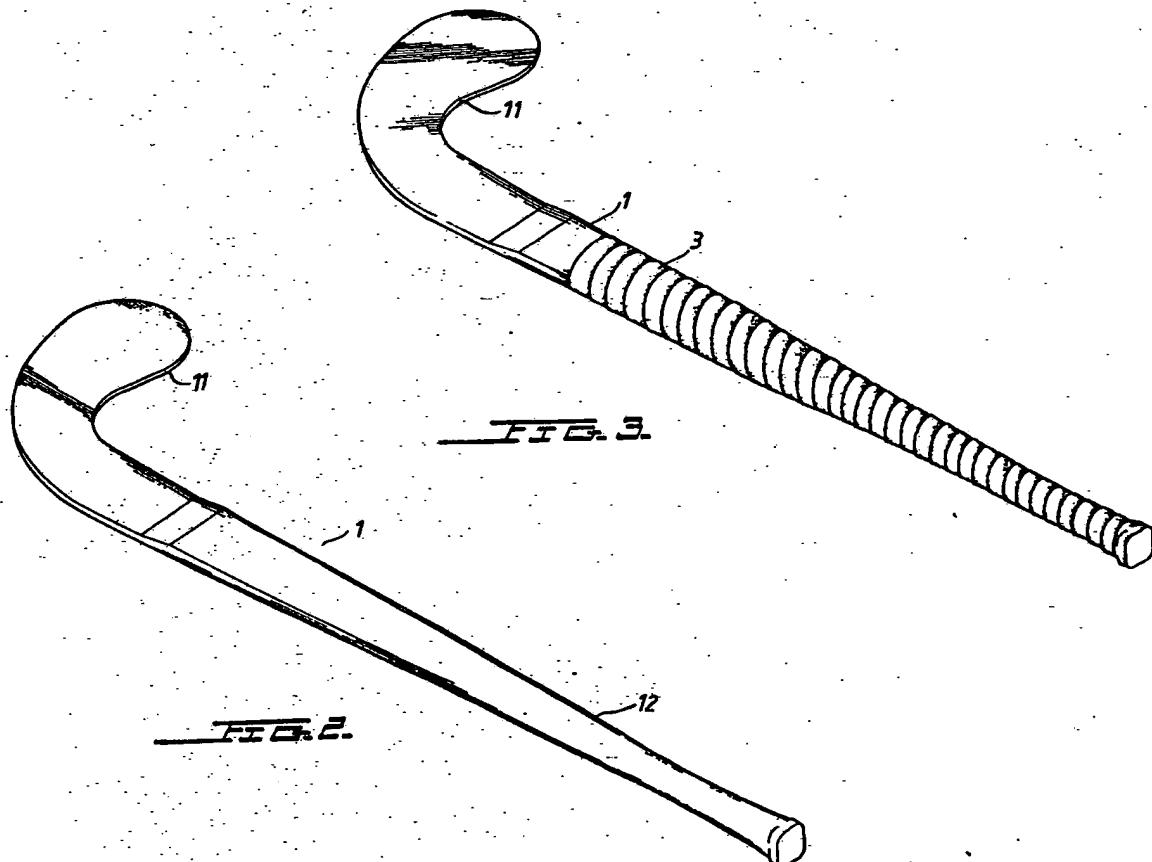
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(56) Documents cited  
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(54) Manufacturing process for composite hockey sticks

(57) A composite hockey stick (1) is formed by introducing polyurethane foaming agent into a mould and heat treating the foaming agent to produce a 'rough' hockey stick. This 'rough' hockey stick is covered with a fibre epoxy resin combination which is heat cured with the 'rough' hockey stick to form the composite stick. The handle (12) of the thus formed hockey stick is covered, e.g. with leather. Alternatively, the resin/fibre is applied to a suitably shaped expandable carrier tube, the foaming agent is introduced into the carrier tube under pressure and the resin and foaming agent are then simultaneously cured.



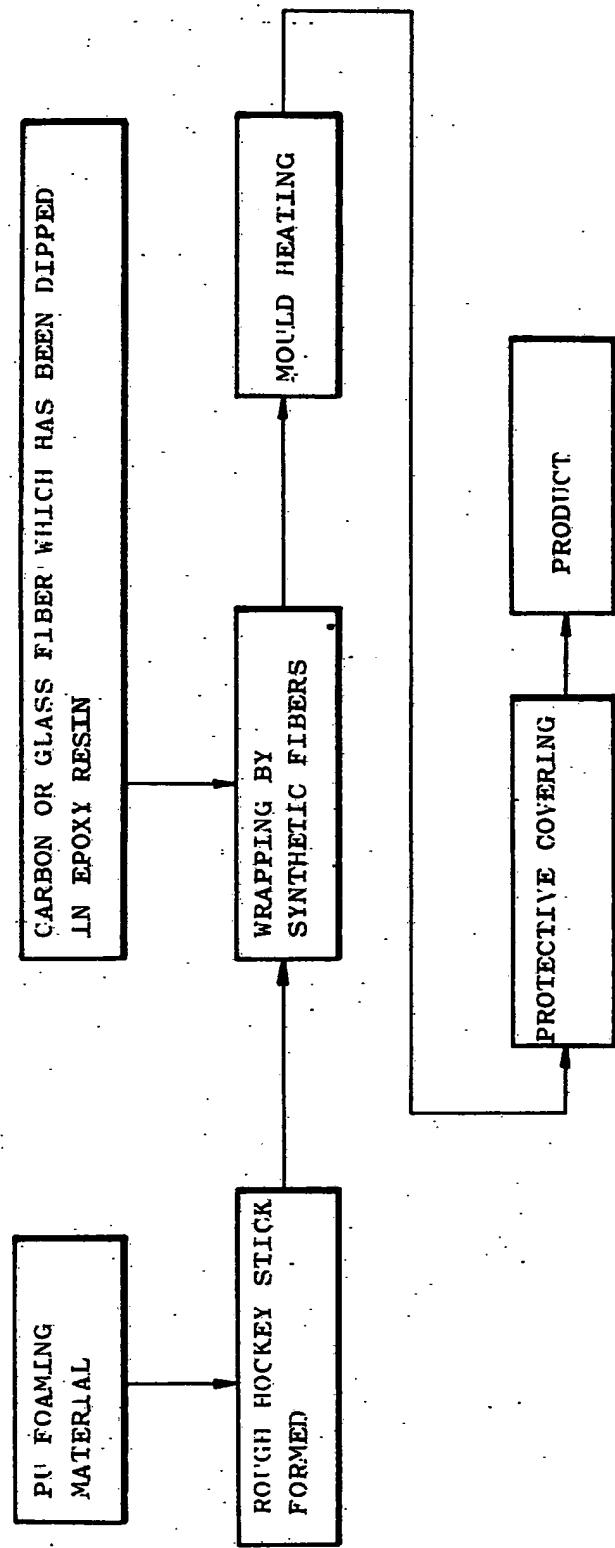
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ORIGINALS

CONFIDENTIAL

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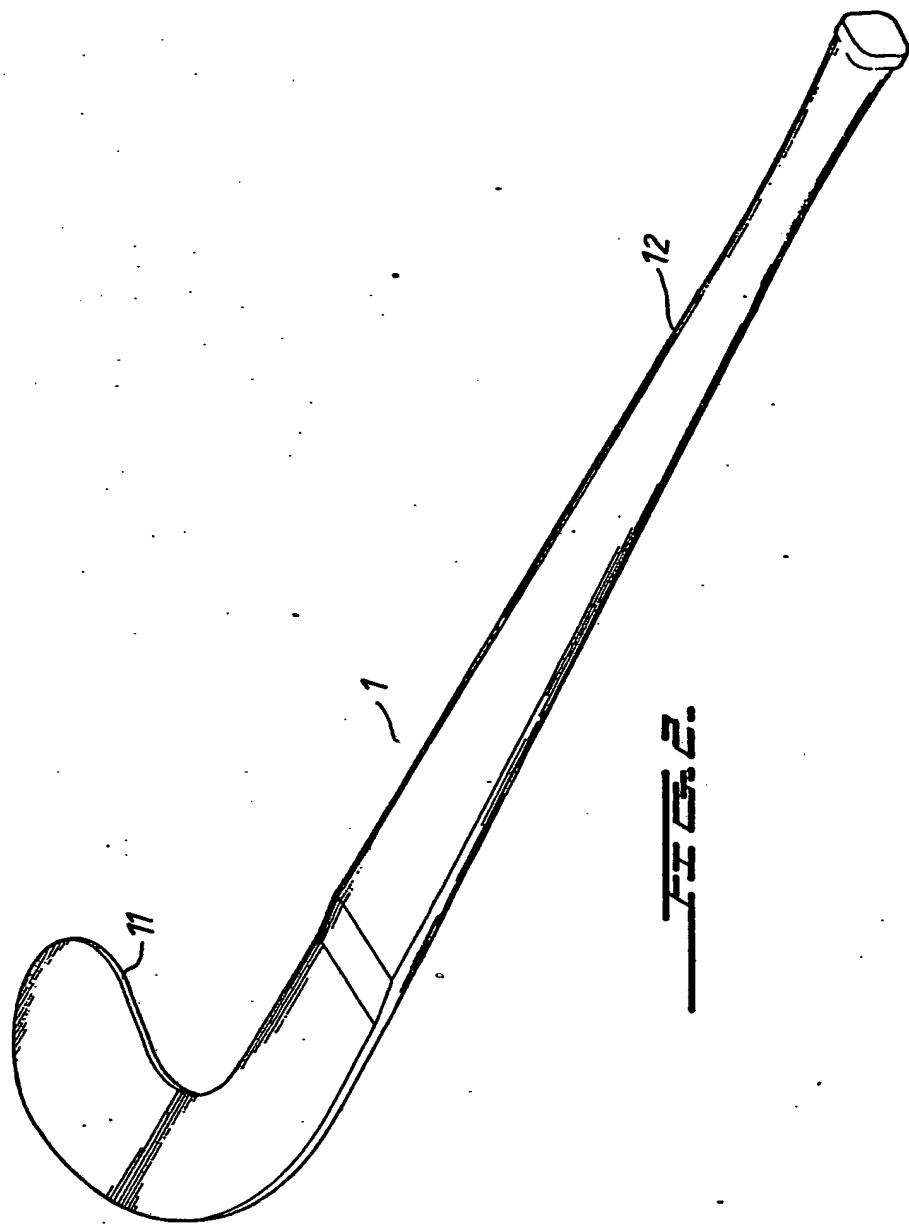
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ORIGINAE

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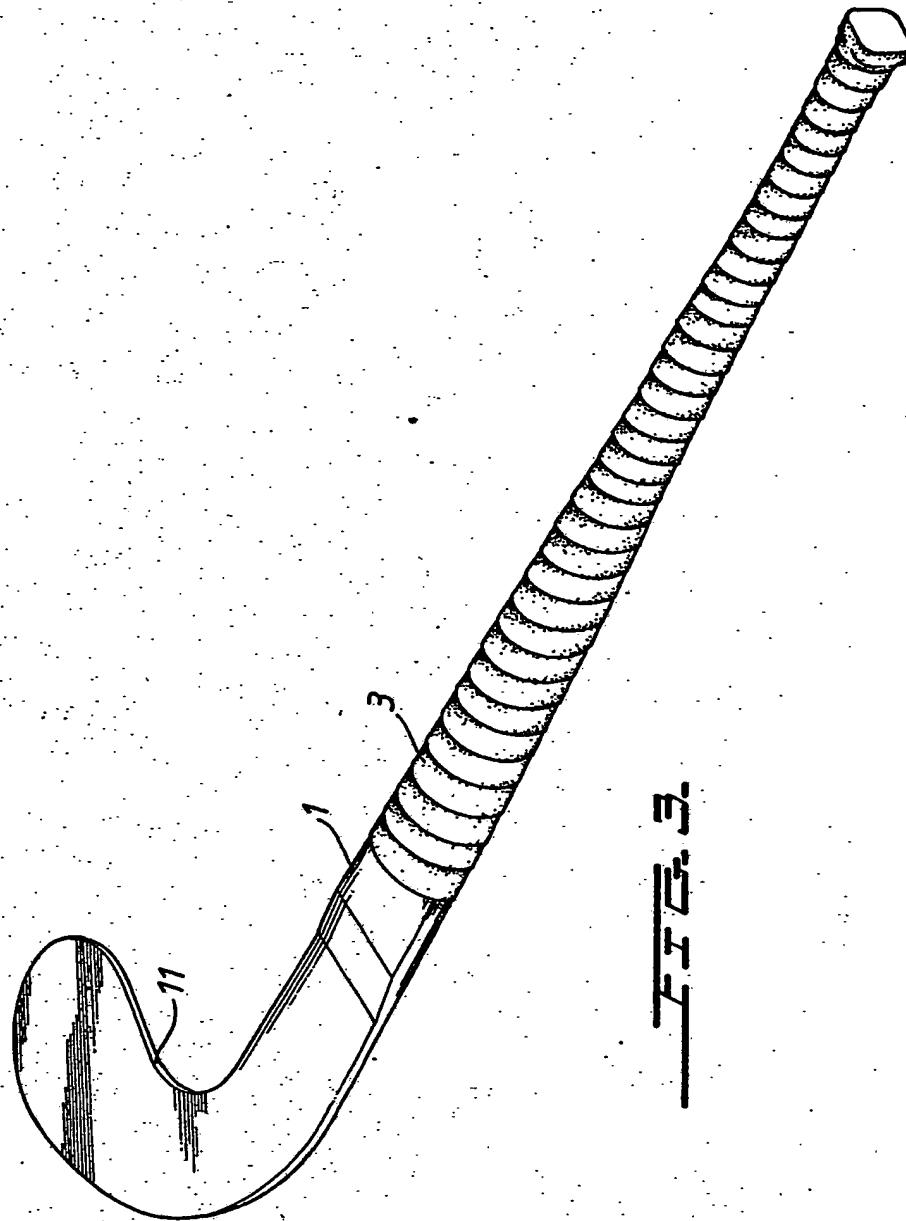
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OPINION

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## MANUFACTURING PROCESS FOR COMPOSITE HOCKEY STICKS

### BACKGROUND OF THE INVENTION

This invention relates to hockey sticks.

It is an object of the present invention to provide  
5 a manufacturing process for a hockey stick which results  
in a hockey stick which is intended to assist hockey  
players in improving the smoothness, accuracy and  
velocity with which they are able to swing a hockey  
stick.

10 A further object of the present invention is the  
production of an improved method of manufacturing a  
hockey stick which makes it possible to produce a  
durable, inexpensive and impressive hockey stick.

### SUMMARIES OF THE INVENTION

15 According to the present invention there is  
provided a process for producing composite construction  
hockey sticks including the steps of:-

(a) introducing a polyurathane (PU) foaming agent  
into a mould defining a hockey stick shape;

20 (b) subjecting the foaming agent whilst in the  
mould to heat treatment to cause the foaming agent to  
set to a 'rough' hockey stick form;

(c) providing fibres which have been treated with  
epoxy resin in such manner that they can form a covering  
25 on the 'rough' hockey stick;

(d) heat treating the 'rough' hockey stick and is covering at such temperature that 'rough' hockey stick and the epoxy resin are both cured; and

5 (e) wrapping a protective covering such as leather around the handle portion of the hockey stick.

Preferably the fibres are applied by applying a plurality of layers thereof to a previously formed 'rough' hockey stick.

In an alternative preferred process the fibres and 10 the associated epoxy resin are applied as a surface coating on an expandable carrier tube defining the shape of a hockey stick, the carrier tube being inflated by filling the carrier tube with the foaming agent under pressure, the resin and foaming agent being subsequently 15 simultaneously cured thereby to provide the composite construction hockey stick.

Conveniently, the heat treatment is carried out at 150 degrees Celsius.

#### BRIEF DESCRIPTION OF THE DRAWINGS.

20 For a better understanding of the invention reference will now be made to the accompanying drawings in which:-

Figure 1 illustrates the principal stages in a process for manufacturing a hockey stick according to 25 the present invention;

Figure 2 illustrates a stage in the formation of a hockey in accordance with the invention the stage producing 'rough' hockey stick; and

Figure 3 illustrates a finished hockey stick with its protective covering.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The method of manufacturing a hockey stick in accordance with the proposals of the invention is indicated in the schematic process stage flow diagram of Figure 1.

In this embodiment of the process, polyurathane (PU) foaming agent is introduced into a mould defining, i.e., having, the shape of a hockey stick. Heat is applied to the mould so that the foaming agent is caused to set into the shape of a 'rough' hockey stick is formed. The overall length of the stick is covered i.e., wrapped with synthetic fibres, carbon fibres, glass fibres, or other material fibres which have been dipped in an epoxy resin. The number of layers of fibres used depends upon the specific specification required for the finished or completed hockey stick.

Referring now to Figure 1, from which it can be seen that PU foaming agent is introduced into a mould defining the desired shape for a hockey stick. The foaming agent is subjected to a heating treatment so as to cause the foaming agent to set into the shape of a basic or 'rough' hockey stick. The thus formed 'rough' hockey stick is then covered with synthetic fibres, carbon fibres, glass fibres or other materials in fibre form which have been dipped in an epoxy resin. The fibres can be, and preferably are, applied to the rough hockey stick by being, for example, wound around the 'rough' hockey stick. The combination of the 'rough' hockey stick and the fibres wound there around is

subjected to a heating stage.

In one embodiment of the process this involves the application of heat to the outside of the mould at a temperature sufficient to cure both the material of the 5 'rough' hockey stick and the resin material. A temperature of about 150 degrees Celsius has been found to be suitable. At this temperature the epoxy resin content of the fibre combination will be cured i.e., solidified thereby forming with the likewise cured PU a 10 composite hockey stick 1 which although in its essentially final form is still unfinished.

After completing the above process stages, the handle portion 12 of the stick is covered with a protective material such as a plastics or natural 15 material 3 such as leather. This covering is provided for assisting the user's grip on the stick during play.

The above discussed process can be modified in detail, for example, by replacing the steps of forming the 'rough' hockey stick and then covering the 'rough' 20 hockey stick with the fibre resin combination with the following steps:- providing a tube of plastics i.e., cellophane or other material which has been dipped into epoxy resin and placing the coated tube within a mould as previously mentioned above. Air at a pressure of 25 6-15 kg/cm is introduced into the tube and heat treatment is simultaneously carried out. The tube is expanded by being filled with EVA or PU filler which cures to form the 'rough' hockey stick.

After the formation of the hockey stick the 30 striking portion of the hockey stick is painted with PU paint.

On completion of these processes the protective wrapping is provided as previously discussed.

While the present invention has been described with reference to the preferred embodiments thereof, it will 5 be readily appreciated that various modifications may be made without departing from the scope of the invention which is defined by the appended claims.

CLAIMS

1 A process for producing composite construction  
hockey sticks including the steps of:-

5 (a) introducing a polyurathane (PU) foaming agent  
into a mould defining a hockey stick shape;

(b) subjecting the foaming agent whilst in the  
mould to heat treatment to cause the foaming agent to  
set to a 'rough' hockey stick form;

10 (c) providing the fibres which have been treated  
with epoxy resin in such manner that they can form a  
covering on the 'rough' hockey stick;

(d) heat treating the 'rough' hockey stick and its  
covering at such temperature that 'rough' hockey stick  
and the epoxy resin are both cured; and

15 (e) wrapping a protective covering such as leather  
around the handle portion of the hockey stick.

20 2. A process as claimed in claim 1, and wherein  
the required application of fibres is achieved by  
applying a plurality of layers of the fibres and epoxy  
resin to a previously formed 'rough' hockey stick.

3. A process as claimed in claim 1, and including the steps of applying the fibres and the associated epoxy resin as a coating on a hockey stick shape defining surface of an expandable carrier tube defining the shape of a hockey stick, inflating the carrier tube by filling the carrier tube with the foaming agent under pressure and subsequently simultaneously curing the resin and foaming agent thereby to provide the composite, hockey stick.

10 4. A process as claimed in any previous claim, in which the heat treatment is carried out at 150 degrees Celsius.

5. A hockey stick when made by the process as claimed in any of the preceding claims.